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United States Patent [19]

Freeman et al.

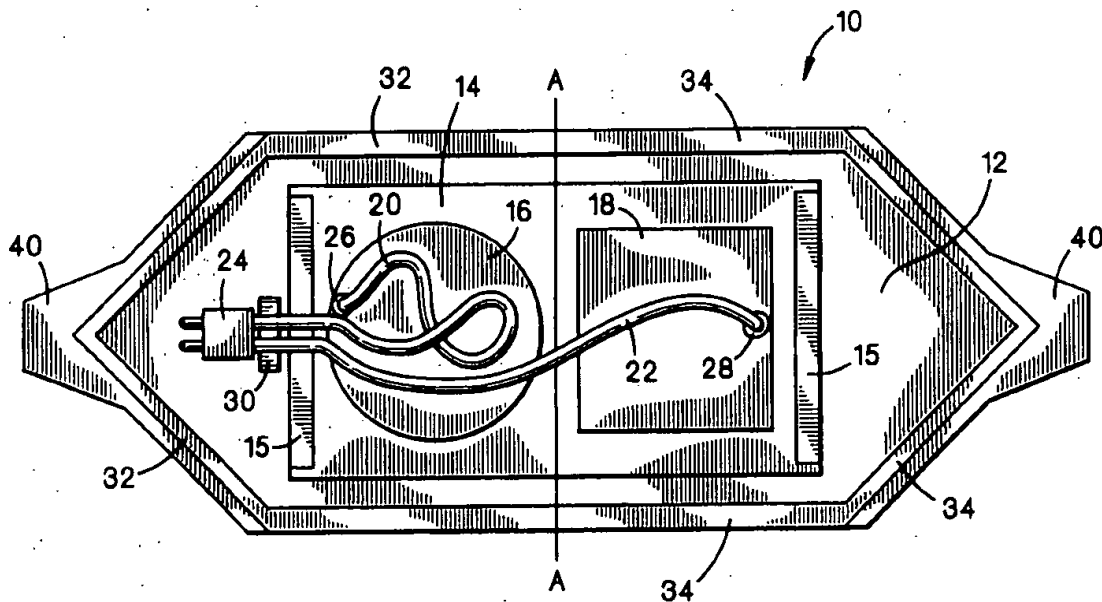
[11] Patent Number: **5,462,157**[45] Date of Patent: **Oct. 31, 1995**[54] **ELECTRODE PACKAGE**[75] Inventors: **Gary A. Freeman**, Newton Center,
Mass.; **Ward M. Hamilton**, Amherst,
N.H.[73] Assignee: **ZMD Corporation**, Wilmington, Del.[21] Appl. No.: **144,665**[22] Filed: **Oct. 28, 1993**[51] Int. Cl.⁶ **B65D 85/86**[52] U.S. Cl. **206/210; 206/438; 206/701;**
128/640[58] Field of Search **206/205, 210,**
206/328-332, 334, 438, 460, 461, 570;
128/640; 607/152, 153[56] **References Cited****U.S. PATENT DOCUMENTS**

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Primary Examiner—Jimmy G. Foster*Attorney, Agent, or Firm*—Fish & Richardson[57] **ABSTRACT**

An electrode package in which one or more adhesively-applied skin electrodes may be sealed has an envelope that includes a sheet of material and a releasable seal joining portions of the envelope to provide a sealed first compartment in which an electrode may be isolated from an external environment. The envelope includes a first wall that defines a first interior surface facing the interior of the sealed first compartment. The first interior surface includes an electrode mounting surface for direct attachment of an adhesive portion of an electrode. The envelope is releasably sealed so that, when the envelope is sealed, the first interior surface is isolated from an external environment and, when the envelope is unsealed, the first interior surface is not isolated from the external environment.

22 Claims, 6 Drawing Sheets

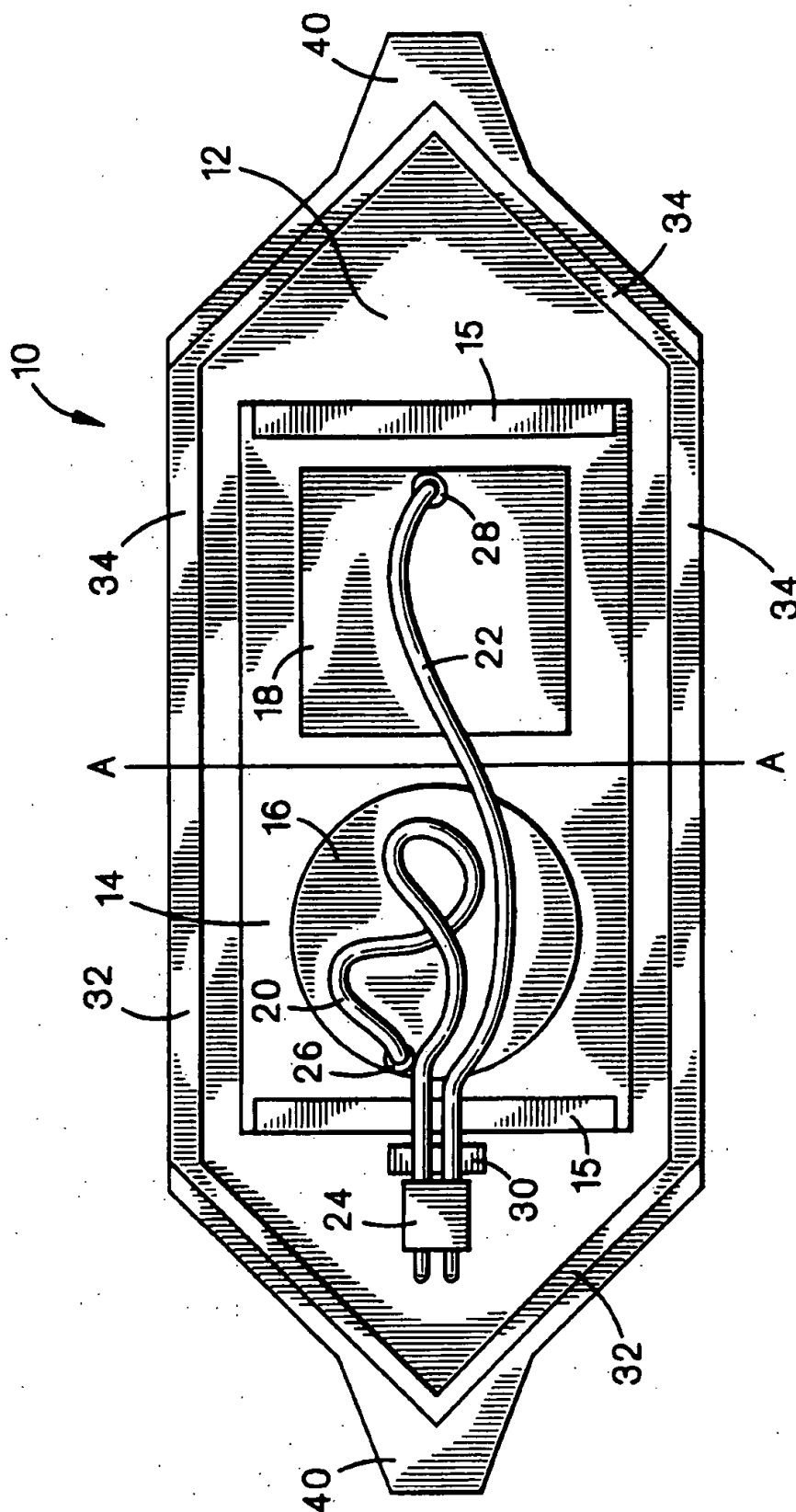


FIG. 1

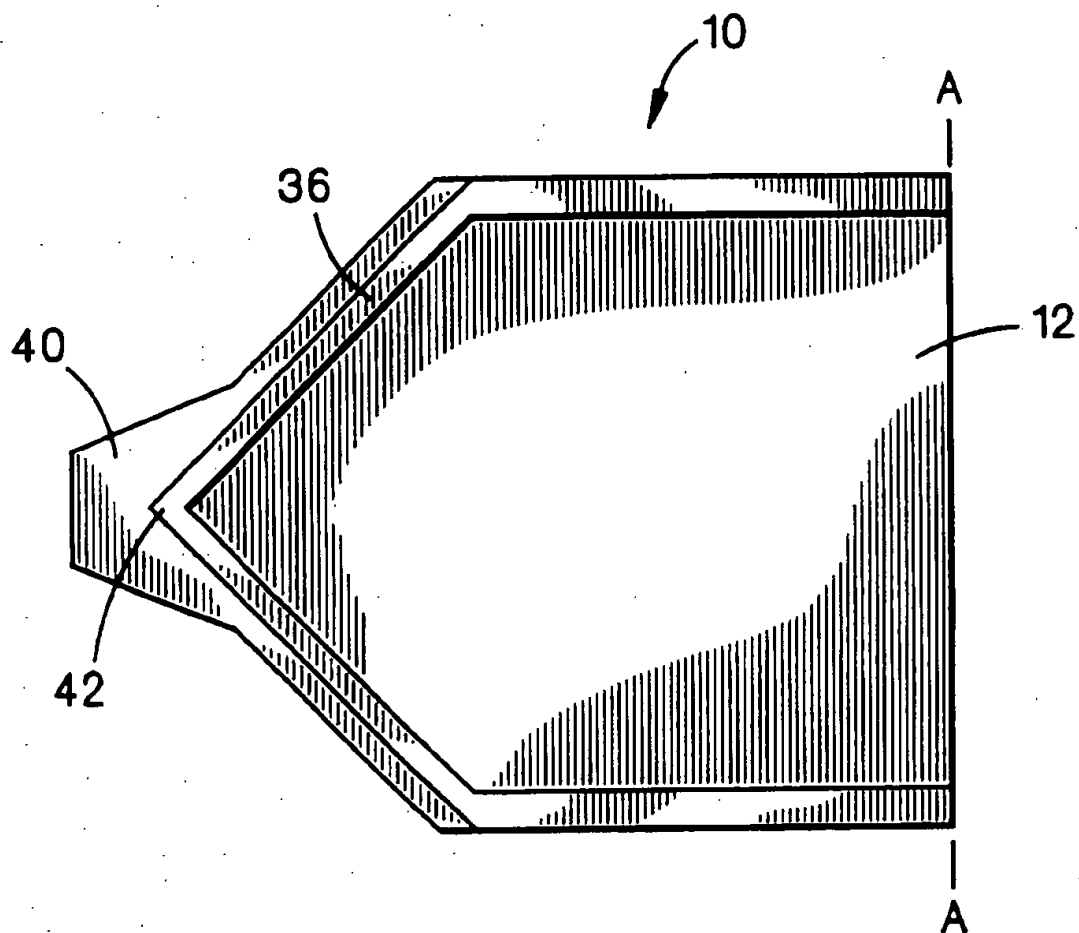


FIG. 2

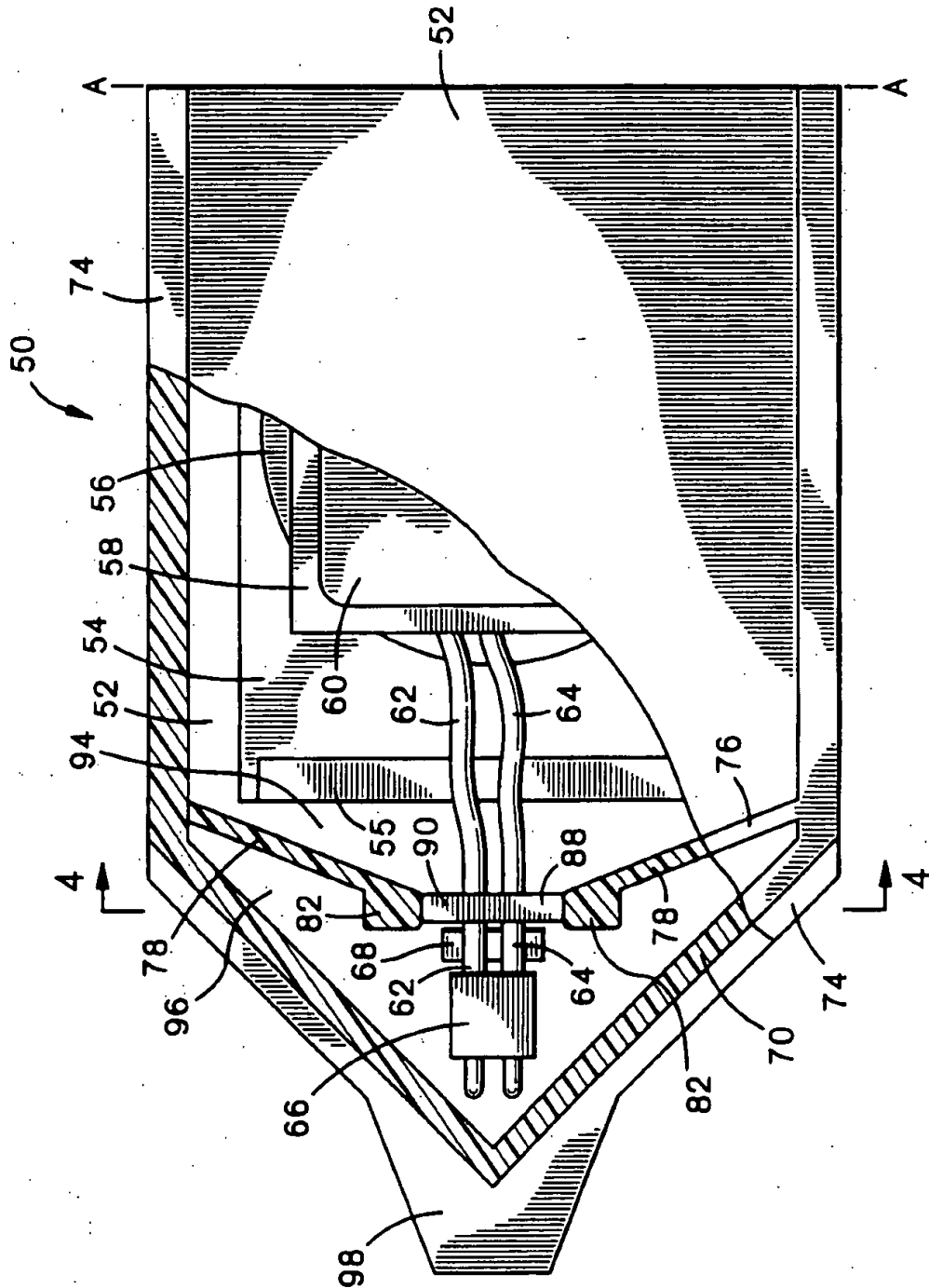


FIG. 3

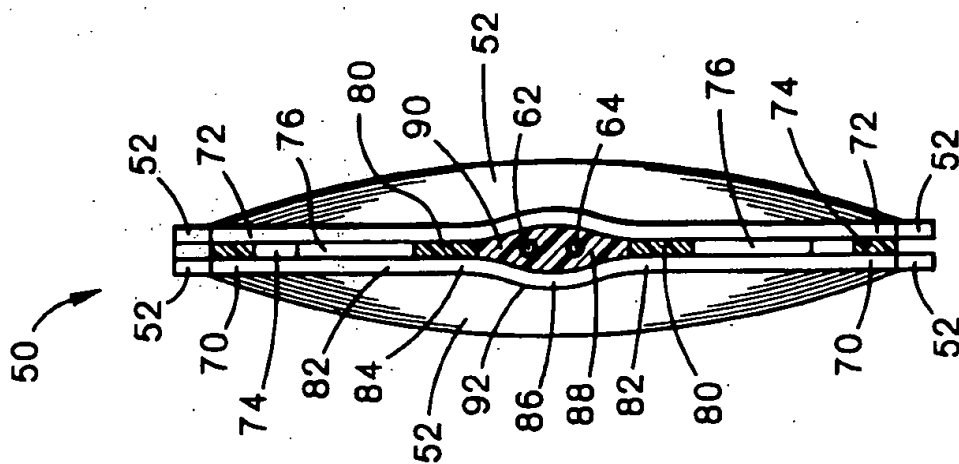


FIG. 4

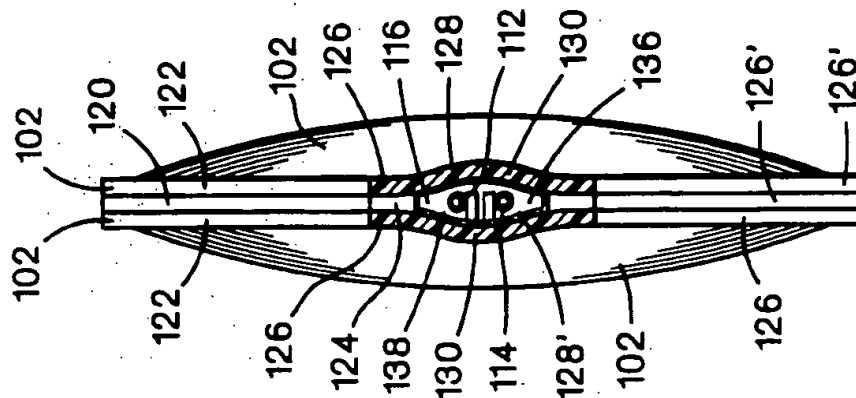


FIG. 6

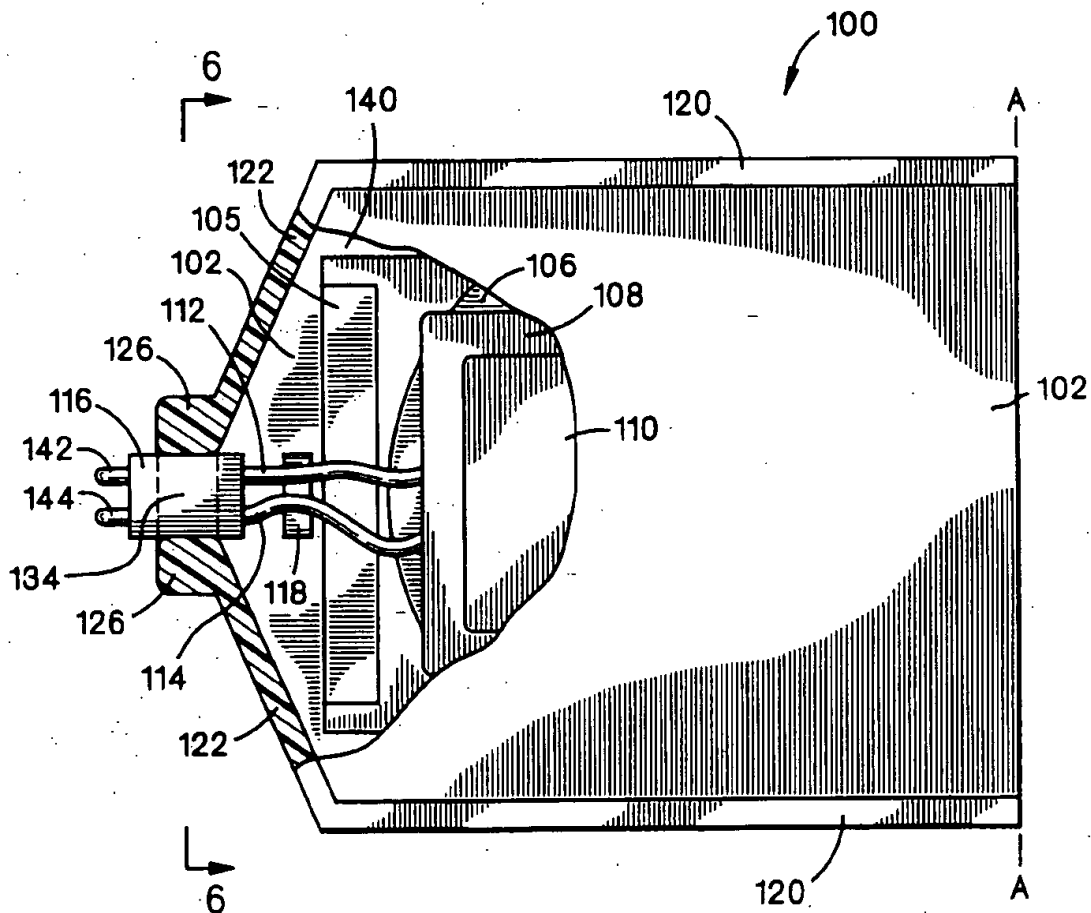


FIG. 5

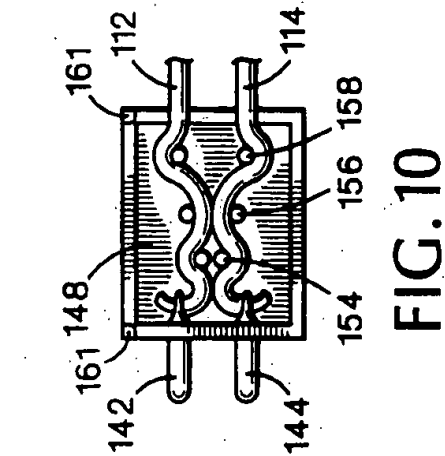


FIG. 10

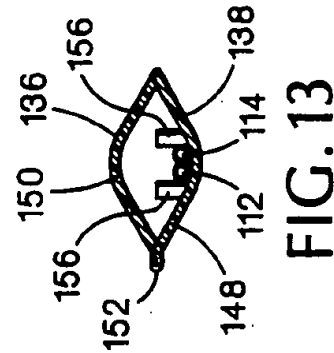


FIG. 13

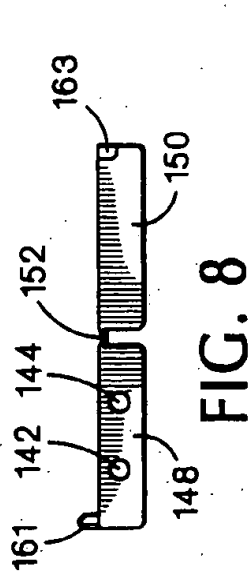


FIG. 8

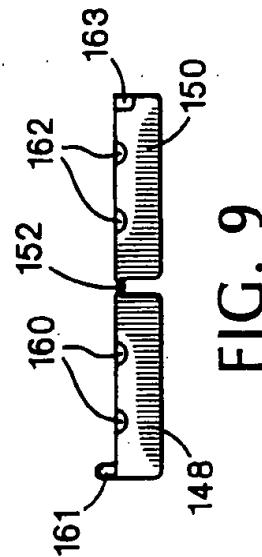


FIG. 9

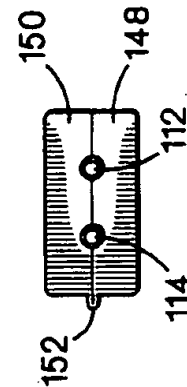


FIG. 12

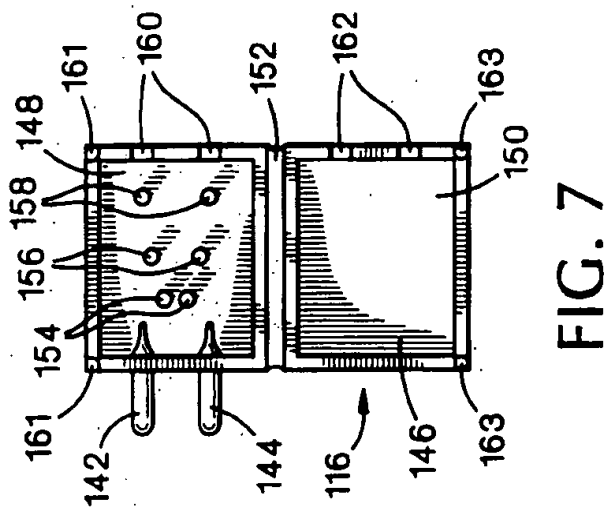


FIG. 7

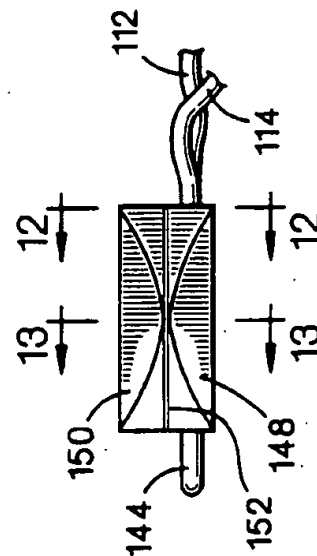


FIG. 11

ELECTRODE PACKAGE**BACKGROUND OF THE INVENTION**

The invention relates to electrode packages.

Skin-applied electrodes used in medical applications such as cardiac pacing or defibrillation are well known. Typically, these electrodes consist of a wire lead that is attached at one end to a connector for a medical device and, at the other end, to a conductor such as a thin layer of tin or another metal resting on a foam backing. The conductor is covered with a water-based, conductive adhesive gel that contacts a patient's skin and electrically connects the electrode to the patient.

To prevent the adhesive gel from drying out, and to maintain the electrodes in a sanitary condition, the electrodes are stored in a package prior to use. In some such packages, plastic covers are positioned over the conductive adhesive gel of each electrode. The covered electrodes are then positioned within a sealed bag. To use the electrodes, medical personnel must tear open the bag, pull out and separate the electrodes, connect the electrodes to an appropriate medical device such as a defibrillator, remove the plastic covers, and apply the electrodes to the patient.

SUMMARY OF THE INVENTION

In one aspect, generally, the invention features an electrode package in which the conductive adhesive gel of an electrode is attached directly to an electrode mounting surface located on an interior surface of a wall of a releasably sealed envelope. When sealed, the envelope isolates the electrode from the external environment and thereby prevents the adhesive gel from drying out. To use the electrode, medical personnel tear open the envelope and expose the electrode.

Because the electrode is attached directly to the interior surface of the envelope, the steps of pulling the electrode out of the bag and removing the plastic cover that were required when using prior electrode packages are condensed into a single step of detaching the electrode from the interior surface of the package. The time saved by the elimination of a step can literally be the difference between life and death in an emergency situation. For example, when defibrillation is required, every second of delay in applying the electrode can be critical. Moreover, attaching the electrode to the interior of the envelope eliminates the risk of dropping the electrode that occurs when the electrode is loosely packaged within a bag or other container.

Typically, a second electrode is directly attached to an electrode mounting surface of a second interior surface of the envelope so that, when the envelope is sealed, the first and second interior surfaces face each other. The envelope is then unsealed in a manner similar to that of opening a book so that the two electrodes, like the facing pages of a book, are located on a single surface. This arrangement, which makes both electrodes readily accessible by medical personnel, further simplifies and accelerates the process of applying the electrodes to the patient. In addition, it provides a compact, efficient package.

For ease of assembly and use, the envelope is formed from a single sheet of material that is folded to form a first edge of the envelope and releasably heat sealed to form the remaining edges. This construction ensures that, when the envelope is opened, the electrode is fully exposed and readily available to medical personnel.

To further ease opening of the package, a pair of tabs are located opposite the folded edge of the envelope. To open the envelope, medical personnel need only grasp these tabs and pull them apart. This releases the heat seal and exposes the electrode.

The envelope also includes a reinforcing layer located at the electrode mounting surface. The reinforcing layer provides structural rigidity and protects the electrode.

Finally, to temporarily secure a wire lead of the electrode during assembly and to prevent the wire lead from becoming tangled, the envelope includes an adhesive strip located on its interior surface.

In another aspect, generally, the invention features an electrode package that has a first compartment in which an electrode is sealed, a second compartment in which a connector of the electrode is sealed, and a barrier element between the compartments that provides an electrically conductive path between the electrode and the connector. The barrier element allows the second compartment to be opened, and the connector exposed, without affecting the seal of the first compartment or exposing the electrode.

Because the connector can be exposed without exposing the electrode, the electrode can be preconnected to a medical device without the risk of contaminating the electrode or drying out its conductive adhesive layer. Thus, the electrode can be connected to the medical device before an emergency arises, and the step of connecting the electrode to the device, and its associated delay, can be eliminated from the electrode application procedure in an emergency situation such as when defibrillation is required.

The barrier element can also be employed in an electrode package having only a single compartment to similarly allow preconnection of the electrode to a medical device.

One method of implementing the barrier element includes forming a layer of material around a wire lead that is attached between the connector and the electrode. The layer is formed so that it includes an arcuate upper portion and an arcuate lower portion. To form the barrier element and seal the compartment, a first wall of the compartment is heat sealed to the arcuate upper portion, a second wall of the compartment is heat sealed to the arcuate lower portion, and the first and second walls are heat sealed to each other.

Another method of implementing the barrier element involves using the connector body as a portion of the barrier element. Typically, the body is formed from a single piece of material and includes an integral hinge. The body also includes strain relief posts that arranged so as to relieve strain on a wire lead located between the electrode and the connector. To ease formation of the barrier element and sealing of the compartment, the body includes a first end located in the compartment, a second end located outside of the compartment, and a central section that is used as part of the barrier element. The central section includes an arcuate upper portion and an arcuate lower portion and the barrier element is formed by heat sealing a first wall of the compartment to the arcuate upper portion, heat sealing a second wall of the compartment to the arcuate lower portion, and heat sealing the first and second walls to each other.

When the features of attaching electrodes to interior surfaces of the envelope and using an envelope having two compartments are combined, the process of applying the electrode to a patient is greatly simplified. Medical personnel no longer have to tear open a bag, pull out the electrodes, separate them, connect them to an appropriate medical device, remove plastic covers from them, and apply them to the patient. Instead, because the electrodes are preconnected

to the medical device, the medical personnel need only tear open the package, detach the electrodes from the package, and attach them to the patient.

Other features and advantages of the invention will be apparent from the following description of the preferred embodiments and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of an electrode package in an unsealed configuration.

FIG. 2 is a top view of the electrode package of FIG. 1 in a sealed configuration.

FIG. 3 is a cutaway top view of a dual-compartment electrode package in a sealed configuration.

FIG. 4 is a cross-sectional view of the dual-compartment electrode package of FIG. 3.

FIG. 5 is a cutaway top view of an electrode package in a sealed configuration.

FIG. 6 is a cross-sectional view of the electrode package of FIG. 5.

FIG. 7 is a top view of an electrode connector in an open configuration.

FIG. 8 is a left side view of the electrode connector of FIG. 7.

FIG. 9 is a right side view of the electrode connector of FIG. 7.

FIG. 10 is a top view of a portion of the electrode connector of FIG. 7, with wires inserted.

FIG. 11 is a front view of the electrode connector of FIG. 7 in a closed configuration.

FIG. 12 is a right side view of the electrode connector of FIG. 11.

FIG. 13 is a cross sectional view of the electrode connector of FIG. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, an electrode package 10 (shown in an unsealed configuration) includes an outer sheet 12 on which is mounted a liner 14 that provides structural rigidity. Outer sheet 12 is made of a polyester, aluminum, TYVEK laminate. Liner 14 is made from styrene and is approximately two millimeters thick. Liner 14 is secured to outer sheet 12 by a pair of adhesive strips 15 that are implemented using double-sided adhesive tape attached between outer sheet 12 and liner 14.

In use, electrodes 16, 18 are attached to liner 14. Wire leads 20, 22, which are attached at one end to a connector 24, and at the other end, respectively, to terminals 26, 28 on electrodes 16, 18, are temporarily secured by an adhesive strip 30. Adhesive strip 30 is implemented using double-sided adhesive tape.

Referring also to FIG. 2, which shows electrode package 10 in a sealed configuration, electrode package 10 is sealed by folding sheet 12 along an axis A so that electrodes 16, 18 face each other. In this configuration, regions 32 contact regions 34. Thereafter, regions 32, 34 are heated to form heat seals 36.

Tabs 40, which are not sealed together, are used in opening electrode package 10. Tabs 40, focus, in a region 42 of heat seals 36, a force applied to tabs 40 by, for example, an emergency medical technician pulling tabs 40 away from

each other. By focusing the force, tabs 40 minimize the force needed to break heat seals 36. Once seals 36 are broken at region 42, additional force on tabs 40 splits the remainder of heat seals 36 until electrode package 10 folds entirely open to expose electrodes 16, 18 as shown in FIG. 1.

Referring to FIG. 3, a dual-compartment electrode package 50 includes an outer sheet 52 on which is mounted a liner 54. As with electrode package 10, electrodes 56, 58 are attached to liner 54 and, when, as shown, dual-compartment electrode package 50 is sealed, face each other. Line 54 is attached to outer sheet 52 by a pair of adhesive strips 55. As shown in the cutaway portion, electrode 58 attaches to liner 54 via a layer of adhesive gel 60 on electrode 58.

Wire leads 62, 64, which are attached at one end to a connector 66, and at the other end, respectively, to electrodes 56, 58, are temporarily secured by an adhesive strip 68.

Referring also to FIG. 4, sheet 52 is folded along an axis A so that regions 70 contact corresponding regions 72 from the opposite end of sheet 52 and are heated to form heat seals 74. In addition, heat seals 76 are formed from regions 78 and corresponding regions from the opposite end of sheet 52; heat seals 80 are formed between regions 82 and corresponding regions from the opposite end of sheet 52; and heat seals 84 are formed between a gasket 88 and regions 86 of sheet 52.

Gasket 88 is produced by forming a layer of RTV or a so-called "hot-melt" adhesive around wire leads 62, 64. Gasket 88 has an arcuate upper surface 90 and an arcuate lower surface 92.

Gasket 88, in combination with heat seals 76, 80 and 84, forms a barrier element between a first compartment 94 and a second compartment 96 of dual-compartment electrode package 50. The barrier element allows second compartment 96 to be opened without opening first compartment 94.

As shown in FIG. 4, gasket 88 simultaneously maintains a seal between compartments 94, 96 and allows wire leads 62, 64 to pass between compartments 94, 96. Thus, gasket 88 provides an electrically conductive path between connector 66 and electrodes 56, 58 even when electrodes 56, 58 are sealed in compartment 94.

As with electrode package 10, dual-compartment electrode package 50 includes a pair of tabs 98 that are used in opening dual-compartment electrode package 50.

Referring to FIG. 5, an electrode package 100 includes an outer sheet 102 on which is mounted a liner 104. Electrodes 106, 108 are attached to liner 104 and, when, as shown, electrode package 100 is sealed, face each other. Liner 104 is attached to outer sheet 102 by a pair of adhesive strips 105. As shown in the cutaway portion, electrode 108 attaches to liner 104 via a layer of adhesive gel 110 on electrode 108.

Wire leads 112, 114, which are attached at one end to a connector 116, and at the other end, respectively, to electrodes 106, 108, are temporarily secured by an adhesive strip 118.

Referring also to FIG. 6, sheet 102 is folded along an axis A and heated to form heat seals 120 between regions 122 from opposite ends of sheet 102, heat seals 124 between regions 126 from opposite ends of sheet 102, and heat seals 128 between connector 116 and regions 130 of sheet 102.

Referring also to FIG. 13, in a central region 134 between heat seals 128, connector 116 has an arcuate upper surface 136 and an arcuate lower surface 138. Connector 116, in combination with heat seals 124 and 128, forms a barrier element between a compartment 140 of electrode package

100 and the external environment. Connector 116 provides a seal for compartment 140 and an electrically conductive path between electrodes 106, 108 and terminals 142, 144, which are connected, respectively, to wire leads 112, 114.

Referring to FIGS. 7-13, connector 116, shown in an open configuration in FIGS. 7-9, includes a body 146 that is a single piece of molded plastic. Body 146 includes a base 148 in which terminals 142, 144 are positioned and a cover 150. Base 148 and cover 150 are connected by an integral hinge 152. Base 148 includes three pairs of strain relief posts 154, 156, 158, a pair of semicircular wire lead cutouts 160, and a pair of male locking tabs 161. Cover 150 includes a pair of semicircular wire lead cutouts 162, and a pair of female locking tabs 163.

At assembly, as shown in FIG. 10, wire leads 112, 114 are connected, respectively, to terminals 142, 144. Wire leads 112, 114 are then threaded around posts 154, between posts 156, and around posts 158 before passing through cutouts 160.

Once wire leads 112, 114 are in place, body 146 is folded along hinge 152 so that cover 150 is positioned on base 148 so that locking tabs 161 engage locking tabs 163. Cover 150 is then sealed to base 148.

Other embodiments are within the following claims. For example, connector 116 could replace gasket 88 in dual-compartment electrode package 50. Similarly, gasket 88 could replace connector 116 in electrode package 100. In addition, rather than mounting electrodes on the interior surfaces of dual-compartment electrode package 50 and electrode package 100, the electrodes could be loosely placed within the packages.

What is claimed is:

1. An electrode package in which one or more adhesively-applied skin electrodes may be sealed, said electrode package comprising:

a first adhesively-applied skin electrode,
an envelope comprising a sheet of material and adapted to open to a generally flat configuration, and

a releasable seal joining portions of said envelope to provide a sealed first compartment, said first electrode being positioned in said sealed first compartment and isolated from an external environment,

said package further comprising a first wall that defines a first interior surface facing the interior of said sealed first compartment, said first interior surface including a first electrode mounting surface attached to an adhesive portion of said first electrode, wherein said envelope may be opened to expose said first electrode to the external environment by releasing said releasable seal.

2. The electrode package of claim 1, further comprising a second adhesively-applied skin electrode positioned in said sealed first compartment and isolated from the external environment, and

a second wall that defines a second interior surface facing the interior of said sealed first compartment, said second interior surface including a second electrode mounting surface attached to an adhesive portion of said second electrode,

wherein said second electrode may be exposed to the external environment by releasing said releasable seal.

3. The electrode package of claim 2, wherein a first edge of said envelope comprises a fold in said sheet of material,

each of said first and second interior surfaces are located on opposite sides of said fold, and

said first edge, said first interior surface, said second interior surface, and said releasable seal are adapted to permit said envelope to be opened by breaking said releasable seal and folding back said envelope at said first edge.

4. The electrode package of claim 3, wherein said envelope further comprises a pair of tabs adapted to aid in breaking said releasable seal, said tabs being located opposite said first edge of said envelope.

5. The electrode package of claim 1, further comprising an adhesive layer for temporarily securing a wire lead of said first electrode to said first interior surface, said adhesive layer being located on said first interior surface.

6. The electrode package of claim 1, wherein said envelope further comprises:

a second compartment for containing a connector of said first electrode, and

a barrier element between said first and second compartments, said barrier element providing an electrically conductive path between said first electrode and the connector of said first electrode.

7. The electrode package of claim 6, wherein said envelope is adapted to permit said second compartment to be opened without affecting said releasable seal.

8. The electrode package of claim 6, wherein said barrier element comprises a layer of material formed around a wire lead of said first electrode, the wire lead providing the electrically conductive path between said first electrode and the connector of said first electrode.

9. The electrode package of claim 6, wherein said barrier element comprises a body of the connector of said first electrode, the body providing the electrically conductive path between said first electrode and the connector of said first electrode.

10. The electrode package of claim 1, further comprising a first reinforcing layer located at said first electrode mounting surface, wherein said first wall is thicker at said first electrode mounting surface than at other regions of said first interior surface.

11. An electrode package in which one or more adhesively-applied skin electrodes may be sealed, said electrode package comprising:

a first adhesively-applied skin electrode,
a second adhesively-applied skin electrode,
an envelope comprising a sheet of material,

a releasable seal joining portions of said envelope to provide a sealed first compartment, said first electrode and said second electrode being positioned in said sealed first compartment and isolated from an external environment,

a first wall that defines a first interior surface facing the interior of said sealed first compartment, said first interior surface including a first electrode mounting surface attached to an adhesive portion of said first electrode,

a second wall that defines a second interior surface facing the interior of said sealed first compartment, said second interior surface including a second electrode mounting surface attached to an adhesive portion of said second electrode,

wherein said first and second interior surfaces face each other.

12. The electrode package of claim 11, wherein said first electrode and said second electrode may be exposed to the external environment by releasing said releasable seal, and wherein, when said releasable seal is released, said first and

second electrode mounting surfaces both face upward and are approximately coplanar.

13. An electrode package in which one or more adhesively-applied skin electrodes may be sealed, said electrode package comprising:

- a first adhesively-applied skin electrode,
- a first compartment containing said first electrode,
- a releasable seal adapted to seal said first compartment and maintain said first electrode in a sealed mode in which said first electrode is not exposed to an external environment,
- a connector of said first electrode,
- a second compartment outside of said first compartment and containing said connector of said first electrode, and
- a barrier element positioned at said releasable seal and providing an electrically conductive path between the first electrode and the connector without exposing the first electrode to the external environment.

14. The electrode package of claim 13, wherein said barrier element comprises a layer of material formed around a wire lead of said first electrode, the wire lead providing the electrically conductive path between said first electrode and the connector.

15. The electrode package of claim 13, wherein said barrier element comprises a body of the connector, the body providing the electrically conductive path between said first electrode and the connector.

16. An electrode package in which one or more adhesively-applied skin electrodes may be sealed, said electrode package comprising:

- a first adhesively-applied skin electrode,
- a compartment containing said first electrode,
- a releasable seal adapted to seal said compartment and maintain said first electrode in a sealed mode in which said first electrode is not exposed to an external environment,
- a connector of said first electrode, the connector being exposed to the external environment, and
- a barrier element positioned at said releasable seal and providing an electrically conductive path between said first electrode and said connector of said first electrode without exposing the first electrode to the external environment.

17. The electrode package of claim 16, wherein said barrier element comprises a layer of material formed around a wire lead of said first electrode, the wire lead providing the electrically conductive path between said first electrode and the connector.

18. The electrode package of claim 17, wherein the layer of material includes an arcuate upper portion and an arcuate lower portion,

- said barrier element being formed by heat sealing a first wall of the compartment to the arcuate upper portion, heat sealing a second wall of the compartment to the arcuate lower portion, and heat sealing the first and second walls to each other.

19. The electrode package of claim 16, wherein said barrier element comprises a body of the connector, the body providing the electrically conductive path between said first electrode and the connector.

20. An electrode package in which one or more adhesively-applied skin electrodes may be sealed, said electrode package comprising:

a compartment for maintaining a first said electrode in either a sealed mode in which the first said electrode is not exposed to an external environment or an unsealed mode in which the first said electrode is exposed to the external environment, and

a barrier element between said compartment and the external environment, said barrier element providing an electrically conductive path between the first said electrode and a connector of the first said electrode that is located in the external environment,

wherein said barrier element comprises a body of the connector, the body providing the electrically conductive path between the first said electrode and the connector, and

wherein the body comprises a single piece of material and includes an integral hinge.

21. An electrode package in which one or more adhesively-applied skin electrodes may be sealed, said electrode package comprising:

a compartment for maintaining a first said electrode in either a sealed mode in which the first said electrode is not exposed to an external environment or an unsealed mode in which the first said electrode is exposed to the external environment, and

a barrier element between said compartment and the external environment, said barrier element providing an electrically conductive path between the first said electrode and a connector of the first said electrode that is located in the external environment,

wherein said barrier element comprises a body of the connector, the body providing the electrically conductive path between the first said electrode and the connector, and

wherein the body includes a plurality of strain relief posts for relieving strain on a wire lead located between the first said electrode and the connector.

22. An electrode package in which one or more adhesively-applied skin electrodes may be sealed, said electrode package comprising:

a compartment for maintaining a first said electrode in either a sealed mode in which the first said electrode is not exposed to an external environment or an unsealed mode in which the first said electrode is exposed to the external environment, and

a barrier element between said compartment and the external environment, said barrier element providing an electrically conductive path between the first said electrode and a connector of the first said electrode that is located in the external environment,

wherein said barrier element comprises a body of the connector, the body providing the electrically conductive path between the first said electrode and the connector, and

wherein the body includes a first end located in the external environment, a second end located in said compartment, and a central section that comprises said barrier element and includes an arcuate upper portion and an arcuate lower portion,

said barrier element being formed by heat sealing a first wall of the compartment to the arcuate upper portion, heat sealing a second wall of the compartment to the arcuate lower portion, and heat sealing the first and second walls to each other.

* * * * *

United States Patent
Kawaguchi

[15] 3,685,645

[45] Aug. 22, 1972

[54] **DEFIBRILLATION ELECTRODE PAD
AND PACKAGE THEREFOR**

2,887,112 5/1959 Smith 128/417
1,411,077 3/1922 Balogh 206/56 AA UX

[72] Inventor: **Harold H. Kawaguchi**, Seattle,
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[73] Assignee: **Physio-Control Corporation**, Seattle,
Wash.

Primary Examiner—Leonard Summer

Attorney—Christensen, Danborn and Matthews

[22] Filed: **Aug. 17, 1970**

[57] **ABSTRACT**

[21] Appl. No.: **64,207**

[52] U.S. Cl. **206/63.2 R**, 128/417, 206/56 AA,
229/56, 229/66

[51] Int. Cl. **B65d 81/22**, **B65d 31/12**, **A61b 19/00**

[58] Field of Search. **206/63.2 R**, **56 AA**, **56 AB**,
47 A; 128/2.06 E, 417

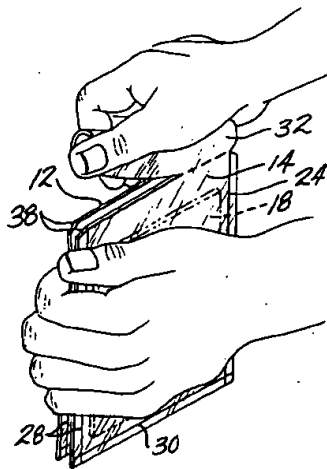
Absorbent pads soaked with a conductive solution are packaged in moistureproof packages in a manner which assures easy access to the pads under the emergency conditions normally associated with the use of defibrillation equipment. Two separate moistureproof containers in the form of plastic bags are sealed together with each bag containing a soaked pad. The two bags are so arranged and interconnected that the user can easily retrieve the pads for immediate application to the chest of a victim.

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5 Claims, 4 Drawing Figures



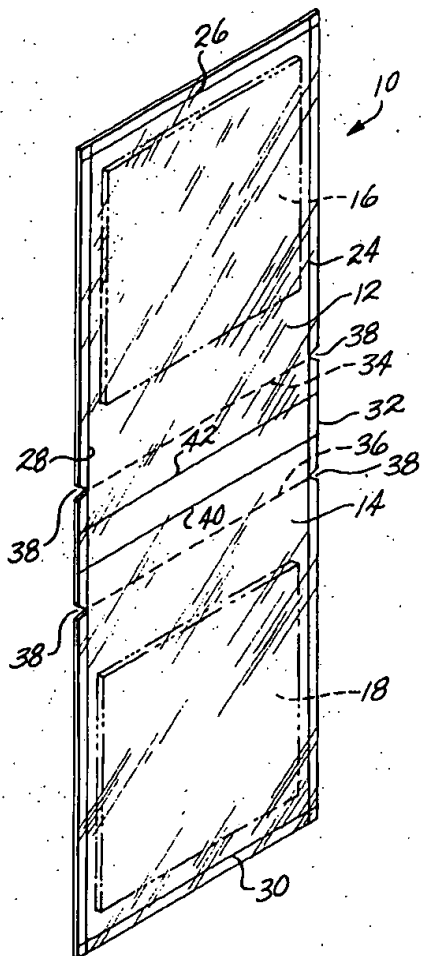


Fig. 1.

Fig. 2.

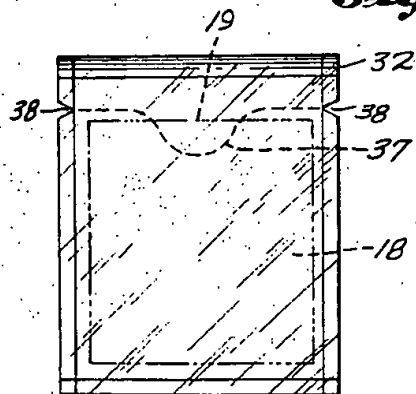
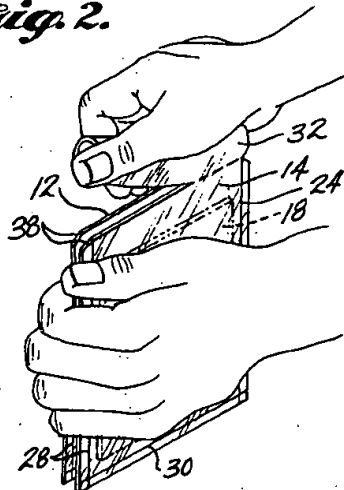
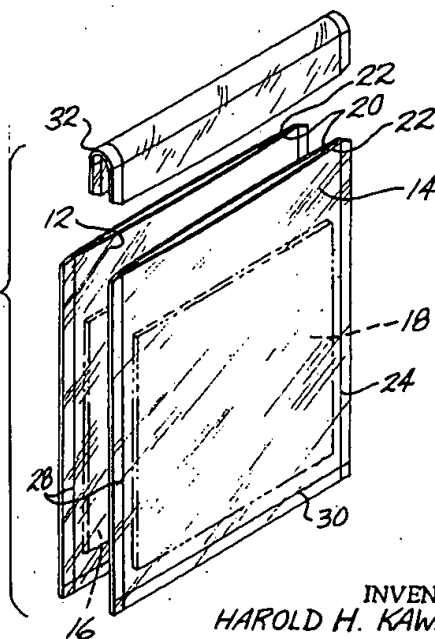


Fig. 4.

Fig. 3.



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BY

Christensen, Lamborn & Matthews
ATTORNEYS

DEFIBRILLATION ELECTRODE PAD AND PACKAGE THEREFOR

Defibrillation equipment of various types is well known at the present time and finds widespread usage in hospitals and is typically carried by emergency rescue vehicles. The defibrillation equipment basically includes a high energy output electric supply together with suitable electrodes for applying a large quantity of electrical energy to the chest of a victim whose heart has gone into fibrillation. In using such equipment it is important that the electrodes made good electrical contact with the chest of the patient so that the stored energy is actually delivered to the victim. Poor electrical contact can result in burning of the skin and also can prevent the application of the desired quantity of electrical energy to the victim.

It is typical in the art of defibrillating a patient to make use of an electrically conductive paste or jelly beneath the electrodes of the defibrillation equipment in order to achieve a low resistance electrical connection. However, such pastes and jellies present a problem in that they typically cause the electrodes to slide about the chest of the patient. When repeated defibrillation signals are required, it is found that the subsequent application of the electrodes to the slippery skin of the patient can present a problem. This is particularly true when the defibrillation is being attempted "in the field" or at a remote location where a person may have suffered the heart disorder. In those cases, as well as in the intensive care units of a hospital, it is extremely important that the defibrillation equipment be placed in operation at the earliest possible time if the life of the patient is to be saved. In order to overcome some of the problems associated with conductive jellies and pastes, pads of absorbent material such as surgical paper or cloth soaked in a saline solution have been utilized beneath the defibrillation electrodes. However a problem has been encountered in that such pads necessitate pre-soaking, which results in limited shelf life of the pads. A saline bath can also be made available so that the personnel using the defibrillation equipment can soak the pads at the time of defibrillating the patient. This of course adds to the time required to actually apply the defibrillation signals to a patient once the patient has been reached. The latter approach is also impractical in those cases where the defibrillation equipment is carried in an emergency vehicle which typically rushes to the scene of a fallen victim, with the personnel typically rushing from the vehicle with the defibrillation equipment in hand in order to apply the defibrillation signals to the victim at the earliest possible moment.

It is therefore an object of the present invention to provide an improved defibrillation electrode pad and package.

Another object of the present invention is to provide a conductive pad assembly for defibrillation equipment with the conductive pad having an extended shelf life and with the package assembly assuring ready removal and separation of two pads.

In accordance with the teachings of the present invention, a pair of pads soaked in a conductive solution are sealed inside of separate plastic bags with the plastic serving to prevent drying of the soaked pads. A saline solution works well for soaking the pads to make them good electrical conductors. Two such bars or

packages are interconnected in a manner which facilitates the immediate removal of each of the pads by the user by tearing the bags at a predetermined location. By having two such separate bags interconnected, the user is always assured of having the required conductive pad for each of the electrode assemblies of the defibrillation equipment typically used at the present time.

The above and additional advantages and objects of the invention will be more clearly understood from the following description when read with reference with the accompanying drawings.

FIG. 1 is an isometric view of a defibrillation electrode pad and package combination according to the invention laid out flat and showing electrode pads contained in pockets of the transparent package with a foldable and removable portion connecting the pockets.

FIG. 2 is an isometric view of the pad and package combination shown in FIG. 1, showing the connecting portion being torn away to open the pockets for access to the pads in accordance with the invention.

FIG. 3 is an isometric view showing the folded connecting portion torn away leaving the pockets open along the severance lines.

FIG. 4 is a side view of another embodiment of the invention, with the package shown folded and having a curved tear line so that when the connecting portion is torn free a portion of the defibrillation pad is directly exposed for ease of removal.

The electrode pad and package combination shown in FIG. 1 consists of a substantially rectangular plastic package 10 having moistureproof pockets 12 and 14 at each end in each of which is contained an electrode pad 16, 18 soaked in a conductive solution, such as a saline solution. The pockets 12 and 14 are formed by opposite walls 20 and 22 bound together by heat or pressure welds along peripheral lines 24 and 26, 28 and 30. The foldable interconnecting portion 32 is bounded by scored tear lines 34 and 36 extending across the package with notches 38 at the ends of the tear lines to make it easier to start the tear under the emergency conditions surrounding use of the pads. The entire package is preferably constructed of a light plastic transparent material such as polyethylene which maintains its moistureproof character over a reasonably long period of storage time so that the pads are maintained moist for maximum electrical conductivity.

The tear lines 34 and 36 may be formed by the heat or pressure welds defining the separate pockets or bags in which the pads are contained, but it is preferred that separate tear lines be provided to assure that the pockets are left open for immediate removal of the pads, as shown in FIGS. 2 and 3. Thus in the embodiments shown the tear lines 34 and 36 are positioned on opposite sides of weld lines 40 and 42 which extend across the connecting portion 32 and separate the pockets 12 and 14 so that the pads and solution contained therein will not move from one pocket to another. The tear lines 34 and 36 may be made before the package is assembled and do not destroy the waterproof characteristic of the package.

A modification of the tear lines for opening the pockets of the package is shown in FIG. 4 wherein tear line 37 is curved in the center downwardly beyond the

edge of the electrode pad 18. Thus when the connecting portion 32 is removed the upper edge 19 of the electrode pad 18, and pad 16 on the opposite side, is exposed for easy gripping and removal of the pad.

The invention therefore provides a simple and easily constructed electrode pad and package combination which enables storage of pre-soaked electrode pads in a convenient manner and quick removal of the pads from the package under the emergency conditions occurring at the time such pads are needed.

What is claimed is:

1. A defibrillation electrode pad and package combination comprising:

- a. a foldable package having two watertight pockets and a connecting portion therebetween;
- b. said connecting portion being bendable along a transverse line whereby said package can be folded so that the pockets lie against one another;
- c. said package further having a transverse tear line across each of said pockets and parallel to said transverse fold line whereby when folded said connecting portion can be torn away along said tear lines to open said pockets simultaneously; and
- d. a defibrillation electrode pad soaked in an electrically conductive solution contained in each of said pockets.

2. A defibrillation electrode pad and package combination comprising a package having two watertight pockets and a connecting portion therebetween, said connecting portion being bendable along a transverse line and scored on each side of said transverse line whereby said pockets can be separated and opened simultaneously by tearing across said connecting portion, and a defibrillation electrode pad held in a conductive solution in each of said pockets.

3. The combination of claim 2 wherein said connecting portion is scored along parallel lines intersecting the respective pockets and is foldable between said lines so that said pockets lie flat against one another and said connecting portion is thereby positioned along one edge of the package to be gripped and torn away to open said pocket simultaneously.

4. The combination of claim 3 wherein said package is formed of plastic walls welded together along peripheral lines defining said pockets, and wherein a weld line extends across said connecting portion between said score lines.

5. The combination of claim 4 wherein said score lines extend across an edge of the electrode pad contained in each pocket whereby said pads are exposed for gripping when said connecting portion is removed.

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